

1 **Bumper 8**

2  
3 **50th Anniversary of the First Launch on Cape**  
4 **Canaveral**

5  
6 **Mr. Robert Droz and Mr. Herman Bank's**  
7 **Oral History**  
8  
9 **Kennedy Space Center**

10  
11 **Held July 24, 2000**  
12

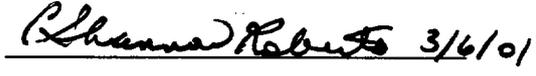
13  
14  
15 **Interviewers: Dr. Roger Launius, NASA HQ**  
16 **Dr. Lori Walters Florida State University**  
17 **Mr. Stanley O. Starr, Dynacs, Inc.**  
18

19  
20  
21 **Transcription: Mary Baldwin**  
22 **Dynacs, Inc., Engineering Development Contract**  
23 **Kennedy Space Center**  
24  
25

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25

**Bumper 8**  
**50th Anniversary of the First Launch on Cape**  
**Canaveral**  
**Mr. Robert Droz's and Mr. Herman Bank's**  
**Oral History**  
**Kennedy Space Center**  
**Held July 24, 2000**

Approval Signature/Date Sheet

Stanley Starr Dynacs Inc.	 3/5/01
Elaine Liston InDyne, Inc.	 3/6/01
Shannon Roberts NASA, KSC External Relations	 3/6/01
Roger Launius NASA, HQ History Office	 3/6/2001

All redlines from all participants have been incorporated in this transcription  
as of March 2, 2001

1 Roger Launius: Mr. Droz and Mr. Bank, I'd like to ask you to, in turn, give your name, a little bit  
2 about your background and your experiences relative specifically to Bumper but just in general  
3 about aerospace. We'll start with you sir [indicating Mr. Droz].  
4

5 Robert Droz: My name is Robert Droz, called Bob. I should start, I guess, by saying  
6 that my first job with the Jet Propulsion Lab was actually with the forerunner which was  
7 called GALCIT - Guggenheim Aeronautical Laboratory, and administered by Cal Tech  
8 which made up the name GALCIT. I was really a hard rock miner prior to this and I had  
9 been working in the desert. The laboratory at that time was in Arroyo Seco in  
10 Pasadena. My mother, my sister, and myself were having a picnic in the Arroyo and I  
11 heard this explosion across the way. The pits, the test pits, for both liquid and solid  
12 research that was going on and the pit itself, the entrance, looked like a mine. So the  
13 next Monday, I traveled over and I talked to some one at the lab and they asked me  
14 what I could do for them and I said, well I have explosive experience and it sounds like  
15 you can use me. And so it was. I was hired there and I stayed with them until 1942. I  
16 was inducted into the service and I served in the South Pacific. I (*\*missing text?*) was  
17 the commander of an ordnance company. Upon my return, I came right back to JPL.  
18 And my introduction then was the WAC Corporal. At that time, they were doing some  
19 motor testing and so forth. Basically, it was just working with the WAC with testing and  
20 the assembly of various components. That was rather short-lived before we started  
21 launching at White Sands Proving Ground. I followed that program through all the WAC  
22 Program, and there were a number. I fail to remember how many there were but there  
23 were a good number. The WAC was at that time as I mentioned before an A and a B.  
24 The A was a heavy motor and the B was a lightweight motor. Those are the launches  
25

1 we took to White Sands. I was responsible for the erection of the sounding rocket, and  
2 also the booster in the launch pad and for fueling it. It was always fueled in the vertical.  
3 Pressurization after that of the tank of the fuel and oxidizer. After that I stepped away  
4 and some one else pressed the button. But that was kind of thing that I did. The whole  
5 WAC program, and I was at White Sands for quite a long time between 1946 until about  
6 1958 when I left JPL for TRW. But during that time, that encompasses also the work  
7 with the Corporal and the Sergeant. So those field operations were exactly the same  
8 that I had done with the WAC. It was all integration, test, and field support.  
9

10  
11 Herman Bank: My name is Herman Bank. I worked for about 8 years in aircraft  
12 development projects and then joined the WAC at the end of the Japanese war. Then  
13 went down to JPL for a job opportunity. (*\*missing text*) At that time JPL was a very  
14 small operation. It had about 200 people and a couple of barracks buildings and a few  
15 test pits, Bob referred to. I thought it was a good place for a temporary job until things  
16 loosened up. That temporary job stretched out into 53 years now. In 1947 when I joined  
17 JPL, I was put on the Bumper Project, as Project Design developer and was in charge  
18 of design development of the Bumper and its integration into the nose of the V2 and a  
19 number of experimental projects that we had testing various subsystems at JPL and to  
20 some degree at White Sands. Then from that time on I was mainly an observer. I went  
21 to all the launchings of the Bumper at White Sands as well as at the Cape. I was there  
22 for project support if anything went amiss; I was supposed to be able to give them some  
23 helpful activity there. From that time on, I sat at the lab and worked on a whole number  
24 of different projects associated with the Explorer, which was very exciting. I remember  
25

1 being up in the blockhouse at that time, and a fellow named Dan Piesecki said when the  
2 information came in on what was happening, the flight data, it showed that one of the  
3 rockets had fired in the wrong direction. It was almost ridiculous. Von Braun said, "It's  
4 a real problem." Piesecki said "No way! The data's no good." He was right. It fired  
5 normally and we did have the first satellite of the U.S. at that time. Beyond that I went  
6 on to many other projects mainly in charge of design-type of activities. Eventually, I  
7 guess, after about 20 years, I got tired of space activities and wanted some thing more  
8 formative for problems here on earth, so I went into Technology Transfer. There we  
9 worked on medical activities, pollution activities, and designed a low pollution  
10 automobile at that time with very very low exhaust fumes. Unfortunately or fortunately,  
11 the Swedes came out with their catalyst after burner which was much simpler and so  
12 that took the stage. Then, the final thing I went into was medicine which I'm still in now.  
13 I'm a retiree. I retired 16 years ago. We formed a retiree association that has 700  
14 members. We have a medical project, where a group of engineers; retired fellows with  
15 34 years of experience work with the major hospitals in Los Angeles and give them  
16 volunteer help in developing new instruments and equipment. It's an on-going project.  
17 We bring some things into the lab that seem appropriate. I can give you a whole story  
18 on that but I don't think I'd better diverge too far on that.

21  
22 Launius: Where and when were each of you born, and a little about your educational  
23 background, and did you have an interest in space flight, or did you read science fiction  
24 when you were boys, or any of those kinds of interesting questions. Had you had a long  
25

1 time interest in this, or did you, like many people, end up in a career path that you  
2 hadn't necessarily chosen from the outset.

3  
4 Droz: When I said I was a hard rock miner, I really meant what I said. I was born in  
5 Mount Union, Iowa, in 1913. I'll be 87 next month. My father was a Baptist minister. I  
6 had two brothers and two sisters. I'm the one left of the family. Growing up we were a  
7 mid-income family. But when I had graduated from high school, at that time, if you  
8 remember 1931, you don't remember that, but it was felt that unless you had a desire, a  
9 real desire for further education, a high school diploma was sufficient. The time was so  
10 bad, if you haven't lived through the depression you have no feeling for that. I was  
11 fortunate, however, in a way, I guess that I had some kind of transportation which other  
12 people didn't. Although I rode a lot freight trains and things like that during that period,  
13 just moving from one place to another. It was difficult. I did a lot of prospecting in  
14 various places. I've mined in most of the Western states. I've ridden cattle outfits. I've  
15 worked in oil fields in Texas. In the woods, many times in summer time and mines in  
16 the winter time because it's warm underground. With those kinds of experiences, I  
17 became pretty positive about myself. I always felt good about myself. I never felt  
18 downtrodden, or anything like that because my father and my mother were very positive  
19 people. So, as I said I had been working in the hard rock mine in the Mohave Desert.  
20 That was in 1940 and then I joined the GALCIT. I had no feeling about space, the only  
21 rockets I knew were the 4<sup>th</sup> of July. So I had no feeling about that at all. But I think,  
22 even though I've had a great life because even after I left JPL, I went with Ramo and  
23 Wooldridge which became Space Technology and then they changed the name to  
24  
25

1 TRW. I was with TRW from 1958 until I retired in 1976. During that time, we were  
2 working with the Thor, the Atlas, and Titan and mostly in second stages and the early  
3 satellite programs that Able program for Thor and Atlas mostly. Worked closely with  
4 Aerojet and other contractors that were here on the Cape. I spent a great deal of time  
5 here during that period from 1958 until 1976. I guess I was prouder of my Army  
6 experience then anything else. Even though I was working at GALCIT at the time the  
7 war broke out, I felt like I wanted to go into the service, and so I was inducted. I went  
8 through basic training, was chosen for Officer's Training School which I attended  
9 ordnance. Within the year I was the commanding officer of an ordnance company of  
10 180 men and five other officers. We served in South Pacific, New Hebrides and  
11 Guadalcanal, Brussels, New Guinea and the Philippines. In the Philippines I met my  
12 wife. We were married then after my service. I really felt good about the service  
13 because I was really rudderless in my life. Because I was working at any kind of a job I  
14 could find. But the Army put me ahead. They straightened me out, and gave me what I  
15 really needed and that was discipline. So I think that was probably the proudest part of  
16 my life; the service. Even though we came through without any problems or that sort of  
17 thing. My company was awarded because of the amount of ammunition, 600,000 tons  
18 that we handled during that period. I was really proud of that part. But not to say that I  
19 haven't enjoyed every launch that I've been on. And I've seen a lot of them, lots of  
20 explosions, lots of failures, but some successes. I've really enjoyed it.  
21  
22  
23  
24  
25

1 Launius: How about yourself, Mr. Bank? Where were you born? And what was your  
2 background; how did you come into this rocketry business; did you like science fiction or  
3 space kinds of things as a kid?

4  
5 Bank: I was born in New Jersey. As a youngster, I guess I was born to be an engineer  
6 because my parents told me that I always took everything apart. I couldn't put them  
7 together but I could take them apart. So I was mechanically oriented at that time. We  
8 came to California because of family health. (\* *missing text*) I studied at Berkley  
9 College. From Berkley, one of the profs there, Dr. Moore, a Cal Tech graduate, took a  
10 few of us who were taking various courses in Engineering to JPL where he was  
11 working. He was a former Cal Tech'er. I ended up in JPL. My major interests were  
12 mechanical engineering and I was really actually oriented toward automotive  
13 engineering but through Dr. Moore I got interested in aircraft, I should say in rocketry. I  
14 also enjoyed travel a lot. I enjoyed wandering around. And like Bob, I was a real bum  
15 for a little while I traveled on freights, learned the ways of some of the bummary of the  
16 Depression. Then I'm wandering a bit here...but at JPL I got involved in the Bumper  
17 project. I really had no early interest in rocketry of any sort. It just happened as a  
18 circumstance of work. I got into the rocketry field, worked with the Bumper and carried  
19 on into the project as I mentioned before.  
20  
21

22  
23 Launius: Let's focus in a little bit on WAC at this point. I'm going to rely on Stan to ask  
24 some of these questions. What were some of the memorable difficulties, issues and  
25 challenges you all had to deal with to get the WAC to work? It was the most

1 sophisticated American-built rocket anyway that had ever been built up to that time.

2 What were some of the issues you had to deal with?

3  
4 Bank: The WAC wasn't built to be a spin-stabilized rocket. Originally, it had been built  
5 it to fly through the atmosphere and here it was flying up in the upper atmosphere where  
6 there was no air to use fins to stabilize. It went partly through that part, so they had to  
7 have fins, but it also had to be stabilized and we used spin rockets to make it stable.

8  
9 The development of spin rockets was a problem and then at the same time the  
10 launching of this thing at high altitudes was a problem. I think Bob mentioned before  
11 that we had made some tests that were on the ground with a small vacuum container  
12 over the end of the rocket to simulate high-altitude ignition. But unfortunately, it wasn't  
13 big enough to simulate the upper stage actual conditions. So when we fired the first  
14 one, we blew up the motor. We recognized that afterwards that it wasn't an adequate  
15 test. We put a diaphragm over the exhaust nozzle of the motor and it worked fine.

16 Then we also had to seal the little spin rockets, Bob has a replica of somewhere along  
17 here. I'd say that those two things were the major complications that we had. That I  
18 can think of.

19  
20  
21 Launius: any thoughts on that?

22  
23 Droz: Larry Saddlemyer's gunk is what we used to seal the spin rockets. There was a  
24 cowboy that found the remains of Bumper 5 and I had gone out and I picked up much of  
25 the debris. A fin, a motor, spin rockets, some of the rollers that were engaged in the

1 nose of the V2 and those are in the museum at JPL. As a matter of fact, I brought the  
2 spin rocket down and it's in the museum here on loan. And a picture of Bumper 5.

3  
4 Bank: I have a piece of one of those rockets incidentally that Bob gave me for a  
5 momento. It's a leading edge of one of the fins that went up to some high altitude at  
6 White Sands. The leading edge of this thing has melted merely from air friction it got so  
7 hot. Sort of like the Space Shuttle. It has all those heat deflectors. Well, the heat was  
8 so hot, that it melted the aluminum on the leading edge of the fin. I have that at home  
9 as a little momento. Along with the first model that we made of the thing when we were  
10 talking to von Braun and his crew to develop the design. I have four-foot model in solid  
11 steel. I didn't bring it because it was just too heavy.

12  
13  
14 Launius: When did that start to take place? These discussions. There was an idea  
15 that somebody had. I'm not quite sure who came up with it and if you all have any  
16 thoughts on that I'd love to hear it, to mate the WAC Corporal to the V2.

17  
18 Droz: Toftoy, wasn't it?

19  
20 Bank: Toftoy was involved. I think, Stewart was involved, it kind of came from a couple  
21 of directions, I believe about the same time. It's not clear which was first particularly,  
22 not that it mattered. They were the ones that got the idea of putting these two together  
23 to establish a staging type of rocket and get high altitudes, high velocities, and learn  
24 about launching, second stages, all those things.  
25

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25

Launius: So there were discussions that took place between the JPLers and the, I'm not quite sure what to call them, the German rocket team at some point.

Bank: They were involved yes.

Launius: Did those discussions take place out at JPL?

Bank: Well, there were conferences out at JPL, involving that. Of course at that time, General Electric was the prime contractor. JPL was a subcontractor as was Alabama with the V2 and I guess Douglas, who were the subcontractor who built some of the equipment, all of the equipment for that matter, of the WAC and the integration nose. Then there was Aberdeen in the payload electronics type of stuff. So they were all in the entire operation of that time.

Launius: Was there a project office per say? Did something get created to oversee the whole effort?

Bank: I guess that...

Droz: I think it was kind of independent in a way, from various areas because I know Toftoy wasn't there. He was some place else. They'd just get together and did brain storm sort of thing and decided what to do, or how we can do it. I think it was as simple

1 as that. And wanted to do it. That was a pressing moment that they wanted to get this  
2 thing done.

3  
4 Bank: They did have coordination meetings. General Electric, of course, oversaw, was  
5 sort of a coordinator over everybody and every so often reviewed the status of things. If  
6 there were any problems, they were made aware of it, this was the leadership. We'd go  
7 back to our home offices and carry on.  
8

9  
10 Launius: Was there any high-level interest that you can recall anyway? Did folks from  
11 the Department of Defense come down and want to get briefed and meddle in your  
12 affairs, as they often do?  
13

14 Droz: Only Ordnance, as far as we're concerned.  
15

16 Bank: There was no meddling. No problems, in terms of difficulties with any  
17 organizations involved or outside organizations. It went fairly smoothly.  
18

19 Launius: Really?  
20

21  
22 Bank: We were very lucky. I don't know that it goes that easily these days.  
23

24 Launius: Not usually. And not for a long time. Did you all have a separate budget item  
25 for the Bumper Project? Or did you just kind of take this out of hide?

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25

Droz: I'm sure you know. Do you know?

Bank: Well, the Army paid for everything. It was funded by Ordnance. They had, I'm sure, some certain amount of funds that they thought was what the WAC and JPL needed. But they had no problems with funds. If they needed more, they got it.

Launius: Ok.

Bank: It was very nice that way.

Droz: The very first effort that came out of GALCIT was JATO units. They're small. A foot long, three inches diameter, or so. And the Marsh Field test where they actually operated the JATO units under the wings of the Aercoup and they also had a Porterfield there. They ran their motors up and took off. They show in the picture, like I said the Aercoup. The Aercoup was probably 200 feet high while the Porterfield was still on the ground. They ran a number of tests. Then even was the Aercoup without a propeller. They do that. Following that, there were liquid motors that were attached to an A20 at Muroc in which I was involved in that also. So those are the early efforts. That's what I was doing, really was, doing a lot of the research, not research necessarily, but doing the hands on kind of thing with the development of the different solid propellants that were used in those JATO units. Incidentally, the WAC was a very simple design. It's hard to describe it but upstream of the motor itself were two diaphragm holders. In that

1 diaphragm were coined so that they would break at a certain pressure. What  
2 pressurized the tanks was when the booster left the launcher, we're talking about just a  
3 WAC launch, when the booster left the launcher, the WAC started just prior to exiting  
4 the launcher. There's a little inertial weight that's held in place by a thread. At the initial  
5 velocity that solid propellant initiated, it was enough to give that little weight enough to  
6 break the string which pressurized the tanks, which burst the diaphragm and the motor  
7 started. But it was really a very simple design. There were other things that happened  
8 during those launches that were really comical. I'll have to tell you about one. We at  
9 one time launched two WACs in 24 hours which was I don't know why they wanted to  
10 do that but it was an immense effort. However, one of the boosters, they were suppose  
11 to land on the outside of the periphery; there was a fence around the launch area. It  
12 was suppose to, there was a certain incident in the fin itself, so it propelled itself in an  
13 arc. Well, for some reason or another, it didn't do that. It came back and there was a  
14 trench that ran from the blockhouse to the V2. There were two launchers at that time,  
15 the WAC and the V2. And it landed square in the middle of that trench. It burned all the  
16 cables, the air lines, the electrical cables, the communications, and there was also a  
17 water line, which didn't help. They put out the fire. But I have a picture of it and its  
18 square in the middle. The technical head of White Sands at that time was Karsh. I  
19 don't know whether you know that name. Karsh? He and I both came out of the  
20 blockhouse at the same time. I came out for a particular reason, I'm not sure what it  
21 was, but when he saw that booster in that trench, he took his hat off, threw it on the  
22 ground and just jumped up and down. It was very difficult because the next Monday,  
23  
24  
25

1 this was on Friday, on Monday that were suppose to fire a V2. It was just a terrible  
2 incident but those things happen and you have no way of predicting it, you know.

3  
4 Launius: I have to ask the next questions; where they able to fire the V2?

5  
6 Droz: Yes. They did.

7  
8 Launius: What did they do, lay new cable?

9  
10  
11 Droz: You know I think they did. They almost had to. But the bundle was probably,  
12 there must have been a hundred cables in that trench. Really a disaster. It was just  
13 one of things that happens when you're doing that sort of thing.

14  
15 Bank: I'm reminded of a disaster that we had at Camp Pendleton. This doesn't have to  
16 do with Bumper but a real fine disaster. We were developing solid propellant rockets  
17 which are the forerunners of the large rockets on the Space Shuttle. So we had a  
18 special large propellant rocket out on a steel rig and everybody was back at the  
19 blockhouse watching, you know. Army particularly, military, everybody, and they lit the  
20 thing off and the rocket motor flame came out and lo and behold a diaphragm at the  
21 head of the motor, had been there for safety purposes, came off which was supposed  
22 to, but then the whole rocket rig, the rocket and the test rig went flying off down Camp  
23 Pendleton. Everybody was flabbergasted. We not only lost the rocket, we lost the rig  
24 with it. That was one of the catastrophes. And we had a number of them. There is a  
25

1 movie, which has been put together called JPL blunders or bloopers. I don't know if  
2 you've seen it or heard of it.

3

4 Launius: No, but I can imagine.

5

6

7 Bank: Oh, it is full of some real good laughs for us. We can look back on it and say  
8 gee, those were really comical in those days but of course, it was blood, sweat, and  
9 tears at the time.

10

11 Launius: I was about 10 years old before I realized that rockets weren't supposed to  
12 blow up. Because every time I saw one they exploded. I guess, we probably should  
13 ask some of the kinds of technical questions and maybe you have some of them, Stan,  
14 that you want to pursue.

15

16 Stan Starr: The whole idea of putting a diaphragm on the back of the rocket motor so  
17 that it would light at altitude; to me that's an incredible idea. How did you make the  
18 diaphragm thin enough so it didn't blow the engine up when it lit?

19

20

21 Bank: It was made of aluminum; it was about 10 or 15 thousandths thick, which is  
22 about as light as you can make it. It merely had to hold one atmosphere in the small  
23 little motor compartment until the two hypergolic fluids got together and lit as an  
24 atmosphere there. After that it blew out. So it was made very light, it blew out about

25

1 one atmosphere, 15 psi. It had a groove around the outside of it, to help it blow out and  
2 in a circle. That's the way we took care of that. Fortunately, it worked.

3  
4 Starr: How did you all know that this was actually causing the problem? The loss of  
5 atmosphere and the . . . . You said there was a vacuum chamber test.

6  
7 Bank: We had a vacuum chamber test. I guess if you looked at the motor it was  
8 splayed open. There was only one thing we could think of that did it was the fact that it  
9 had exploded.

10  
11  
12 Starr: So it accumulated propellant.

13  
14 Bank: What it did was accumulated vapor propellants that didn't light and then suddenly  
15 went off. And then there was an explosion.

16  
17 Starr: The WAC used red fuming nitric acid and aniline as propellants. There's been  
18 some controversy over the desirability of those propellants in a rocket vs. liquid oxygen  
19 and some other hydrocarbon, whether it's ethanol and water like the V2 or kerosene or  
20 whatever, and when the V2 came along it seemed to have eased out the use of nitric  
21 acid as an oxidizer. Red fuming nitric acid was used in upper stages. The big boosters  
22 stayed with liquid oxygen but there are some compelling reasons why it could have  
23 been used in the big boosters. Do you all have any thoughts on that?

1 Bank: The specific impulse of liquid oxygen and hydrogen is much more than aniline  
2 and acid. So from a performance stand point it was a big advantage to using it in the  
3 big places. We started with the JPL (*\*missing text*) with acid/aniline because they  
4 were hypergolic and simplified ignition, which they were having some troubles with at  
5 that time. They used to have some sort of a little spinner sitting in the mouth of the  
6 hydrogen/oxygen motors who tried to light them and they had trouble with that time so  
7 we went to hypergolic things to avoid that problem. I guess that's the main reason that  
8 we had acid/aniline. After a while of course, they learned how well to ignite the  
9 hydrogen, oxygen. The specific impulse was so much higher so it's used for the lower  
10 and upper stages. Higher performance was the main reason.  
11

12  
13 Starr: You said that the WAC fins melted. Now were they made of machined aluminum  
14 or were they sheet metal?  
15

16 Droz: The original WAC, that is for the WAC program, were just normal formed fins  
17 rounded leading edges, but with the Bumper it was milled aluminum. It was formed into  
18 the fin itself. Also, the fins, the configuration had changed somewhat and there was a  
19 fin added. There are four fins instead of three (*\*missing text?*) to give it more stability.  
20

21  
22 Starr: Was this melting on the Bumper WAC?  
23

24 Droz: Yes, the one on the Bumper 5 is where we found this. And if you have occasion  
25 to go to the museum and look at that spin rocket you'll see the melted aluminum on it.

1 That was a little faring that covered the spin rocket and it melted and there were some  
2 deposits of aluminum on the spin rocket itself.

3  
4 Starr: Did JPL build the nose with the electronics of the WAC for the Bumper WAC or  
5 did somebody else do that?

6  
7  
8 Bank: The electronics was done by Aberdeen, I believe, and the nose shell was built by  
9 JPL. The shell was removable when you put the electronics inside and we cover it then.

10  
11 Droz: In one of the pictures that the gentleman showed us where it shows the bumper  
12 complete on the stand, and there's a configuration at the tip of the WAC that we don't  
13 understand. I don't remember it. I remember that there was a probe on the tip. It  
14 almost looks like it was a bird there. I don't remember that. No memory what so ever of  
15 that.

16  
17 Bank: No idea what it is.

18  
19  
20 Starr: There's a thing that was used later on the nose of the Apollo escape tower, I  
21 think it was called the "Q-ball." But it was an array of pitot tubes so you get total air  
22 pressure. If you were off angle on the angle of the attack into the air stream, it would  
23 show differences and Dryden has actually used it as control inputs for high performance  
24 jet aircraft. They call it a flush air data system; it's still in development. That's what it  
25 looks like to me.

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25

Droz: The other little probe was that, that's what I thought. It would determine the performance. But it looked nothing like that. It looked more like a three-pointed arrow, gimbaled.

Starr: Now which was this?

Droz: This was one that I remember on 8 anyway. I don't remember that at all. Neither of us remembers that at all. It's beyond me.

Starr: Well, the report put out by the Long Range Proving Ground said that when Bumper 8 launched, the V2 flight was normal and then the WAC motor failed to ignite. The optical data indicated that the nose had collapsed. There was something about testing of a new Teflon nose.

Droz: Yeah, there was a Teflon nose, all right.

Starr: I know from talking to you on the phone that you didn't recall . . . . .

Droz: It was sheath of Teflon.

Starr: Is this over aluminum?

1 Droz: I think so, wasn't it?

2

3 Bank: I think so. Just about have to be. Yeah. And I remember talking about the little  
4 widget on the top end there. It could be somebody put that on prior to launch and took it  
5 off, I don't know. I don't recall anything on it ever...

6

7

8 Droz: That's a possibility, you know, because it was a delicate instrument.

9

10 Starr: Yeah, electronics was very sensitive at that time. You can tell from all the launch  
11 delays caused by replacing something.

12

13 Droz: Right. That's true.

14

15 Starr: Perhaps Aberdeen has got data.

16

17

18 Launius: You can go look at the records there.

19

20

21 Starr: When the Germans came over they brought over an engineering culture with  
22 them that was presumably or supposedly different than the American engineering  
23 culture and systems engineering or whatever. Can you all comment on any influence  
24 that they may have had on how Americans approached rocketry engineering or did you  
25 notice any?

25

1 Bank: They certainly had more experience then we had in large rockets and particularly  
2 in the oxygen and alcohol fuels and larger rockets, that sort of thing. They certainly had  
3 expertise there. They were excellent technical people and we got to know a number of  
4 them and worked well with them. An interesting story I don't know if that belongs here  
5 or not but I'll tell it. You know half of their crew from Peenemünde, about 100 of them,  
6 came with von Braun and defected to the American side, the Allied side, and the other  
7 group, which was larger, went to Russia. They were absorbed by them. We had the  
8 unique experience of having one of the fellows that was on the other side and went to  
9 Russia and was there for 10 years come back and joined the JPL crew. It was  
10 interesting to see what they did. How we treated them and how they treated them. It  
11 was very similar. They gave them the red carpet treatment and in effect brain drained  
12 their technology and then after the ten years they felt they had all the experience they  
13 could get out of them, they released them and this fellow happened to come back. It  
14 was interesting talking with him. That's where they got their rocket experience, too.

15  
16  
17 Starr: Do you remember the fellow's name, by any chance?

18  
19 Bank: No, I don't.

20  
21 Droz: I worked with Dr. Thiel at TRW, he was one of that group, but this was later on  
22 when they began to spread out into other companies that were aerospace; Hughes or  
23 Lockheed or whatever. While I was at White Sands and we were doing a WAC then,  
24 the Germans were there and we were in the same hangar except that there was a wall  
25 between the German operation and the WAC operation. We were associated with them

1 all the time at the mess hall so we got to know them and there was no conflict. We had  
2 our own job and we didn't need any advice from them on WAC, but we recognized what  
3 they were doing and of course later on the Bumper we worked a little closer with the  
4 Germans. I don't think any of our troops spoke German at all, and theirs was kind of a  
5 halting English so we really didn't have much in common except we were all working on  
6 rockets. This wall separated us but not technically. I don't know, it was just one of  
7 those things, maybe they worked a little differently than we did so there was a  
8 separation, but not personally. Nice bunch of people. We were in the early days when  
9 it was really a blast to work. Homer Joe Stewart is a great friend of mine and I talked to  
10 him not long ago, but he is just not well and he couldn't make it and I was really sorry  
11 because Homer Joe was as common as an old shoe. He may not think so because he  
12 is a world renowned aerodynamicist, but when you're together he is so much fun and he  
13 introduced me to the five-cent tequila in Juarez. He didn't like the bright lights. He  
14 didn't like to go where all the shows are. He'd rather go to a bar that's back off the side  
15 street where all the Mexicans go and there tequila was five cents. And he would  
16 engage these people in conversation and it was great fun to be with him, great fun,  
17 great guy, common. He wore a cowboy hat, big, if you picture like Indian Joe-type.  
18 Every time he was out in the field, he always wore the hat, but never in town; I mean in  
19 Pasadena or JPL, just a quirk of his. But he was a great guy, great individual.

20  
21 Launius: How large was JPL in terms of personnel during this period in 1949, 1950,  
22 1951?

23  
24 Droz: When I left, GALCIT it was 46 people.

25

1 Bank: When I came it was 200. And now it's 5000 with subcontracting engineers all  
2 over the surrounding countryside.

3  
4 Launius: So, it was a very small confined group, did you all did know each other?

5  
6 Bank: That's right. We learned as we went along.

7  
8 Launius: The people that were at JPL during that period; the late '40s and early 50s,  
9 the majority of them were working on rocketry at that point. Were any of them doing  
10 space science? JPL got out of the rocket business, as you know, later on.

11  
12 Droz: Not while I was there, not really, no.

13  
14 Bank: That came on after the Explorer actually.

15  
16 Launius. So basically, you guys were building rockets, all of you.

17  
18 Droz: That's right. The sergeant was solid propellant, Thiokol built, the single case, it's  
19 different than the segmented cases that they use with the Shuttle Program, and this was  
20 fired at White Sands, also, so I was along with the crew that launched that. I developed  
21 the destructor for it, also.

22  
23 Launius: As long as JPL was working on rockets, did they transition their activities from  
24 White Sands out here to the Cape or did they stay at White Sands most of the time with  
25 their rocket work?

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25

Bank: I think they had both for a while anyway. I don't know if they do anything more out there. I don't think so.

Droz: I think the first of their operation would be Explorer.

Launius. Back to Bumper, now. In terms of Bumper, how did you all bring the rocket out here? Did you bring it out assembled, or did it come out in pieces and you put it together here at the Cape in 1950?

Bank: It was assembled.

Launius: Did you truck it out, or fly it out, or ship it on a boat?

Droz: I think we trucked it out. Yes, sure we did because we also trucked the red fuming nitric acid; also the aniline was trucked down. We had a very large service vehicle for the fuel and the acid was contained in an aluminum 1-inch thick cylindrical tank on the back of the truck.

Launius: That truck didn't stay here. It was something you brought in for the launch and then left, so there was no storage facility here.

Droz: Right, that's right. That was at White Sands. As far as bringing the fuel and oxidizer, I don't recall now, how we did that. Maybe it was locally available.

1 Bank: I would expect that it was trucked the same way.

2  
3 Droz: I suppose so, but I don't think we did that. None of our equipment.

4  
5 Starr: I think when I talked to you on the phone, Mr. Droz, you said the containers here  
6 were not as good as what you had back at White Sands. You made some kind of  
7 mention about the containers.

8  
9 Droz: We may have gotten mixed up because I was talking about White Sands when I  
10 was talking about the big aluminum tank and also the fueling vehicle. The fueling  
11 vehicle was a large contraption, really, and the fueling equipment for the acid was just a  
12 single tank and that was only used there at White Sands, not here.

13  
14 Starr: The official report also mentions, I think on the preparations for Bumper 7, but I'm  
15 not sure, there was an acid spill from the WAC or from a fuel container or an oxidizer  
16 container. Do you recall anything about that?

17  
18 Droz: Well, the gentlemen there showed me a picture of that spill but I was not aware of  
19 it. We were here during those operations, because there was some concern in my  
20 mind, as I remember it, the fuel was loaded horizontally and there was a concern of  
21 mine that we would develop an air bubble in the system. There was no way that we  
22 could open a fitting and let the air escape or purge the system before you fill it. And if  
23 you don't get the proper mix, you're in big trouble and so that was a real concern of  
24 mine. And if you do it horizontally, you have no way at all of getting rid of that air. And  
25 so, as I recall, and these pictures prove that they loaded the acid vertically. And that

1 was not so much of a concern of mine because the acid goes directly to the burst  
2 diaphragm and that probably wouldn't be any problem. But the fuel has to go through  
3 the cooling passages around the motor itself, and the consequence is great fear that  
4 you trap air in the system and you get that bubble at the time of ignition, it will blow the  
5 engine. So that was a real concern. And, I think if I remember correctly, that fueling  
6 horizontally and then they lifted it to hopefully satisfy those requirements.

7  
8 Starr: What about your relationship with Douglas? What did Douglas do versus JPL  
9 people in the launch preparations and building of the WAC and so forth?

10  
11 Droz: McCullough was here just as a part of the crew, but it was just their responsibility  
12 because Douglas had built the WAC and there was also Anderson, McCullough and  
13 Anderson, I believe. Although in one of the reports that I read, they said that there were  
14 five engineers here from Douglas, I have no recollection of that but I do know Fin  
15 McCullough very well, and Anderson, also. I knew they were here. And I saw a report  
16 in "Product Engineering" that was an interview to Joe Stanton who was also from  
17 Douglas, so there were at least those three people that I knew of that were here.

18  
19 Launius: How did you all go about mating the WAC to the V2? They were both  
20 horizontal.

21  
22 Droz: Right

23  
24 Launius: Were they both on some sort of vehicle at that point and then you drove them  
25 together and mated them in that way?

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25

Droz: Well, its hard to remember exactly how we did that, but all that's necessary is just to engage the rollers that were in the aft section of the WAC itself to the rail of the V2. That railing was substantial and its the only attachment from the WAC to the V2. There was no other attachment, no levers, no gadgets that had to be released or anything like that. So it was just a slip fit, is what it was. So it was just more man handled, not picked up as such, but moved with some kind of vehicle, and my memory fails me.

Launius: Alright, ok. Other questions?

Lori Walters: Yes, I have a question in regard to safety. Today we place such an emphasis on safety concerns out here at the Cape, what I'm curious about is how do safety concerns here at Cape Canaveral vary from the safety precautions that you took at White Sands.

Droz: In fueling at White Sands, I did most of the fueling personally, so all I did was use a face mask with either one; acid or aniline. In those days we had the flexible hoses. They were stainless with a mesh outside the bellows, but with a little use, the bellows would break or there would be a pinhole. I can remember distinctly loading the WAC and a pinhole developed and it burned the top of my head. It was like a very fine mist, but a little soda water takes care of that. There's no problem, you know, but whenever I was around acid again, I always felt that. It was impressed on my memory. But, we were pretty casual. We understood what it was and we took the precautions, but mostly it was all just facemasks and rubber gloves.

1 Walters: Both here and at White Sands?

2  
3 Droz: Well, now, I can't answer for here because I saw some pictures that show people  
4 in suits, and again I don't remember. Obviously, they were a little more stringent in their  
5 operation regarding safety concerns.

6  
7 Walters: I'm curious about what would be a typical working day for you in relation to  
8 hours and I'm not talking about something like immediately prior to launch, like a day or  
9 two before launch, but an average working day. What time would you arrive here and  
10 what time would you go back to where you lived?

11  
12 Droz: Herman and I both were living at the bachelor officer's quarters at Patrick and I  
13 don't really remember, but most of our operations with the WAC were done at Patrick.  
14 We had a hangar somewhere. I don't know where it was, I have no idea, but that's  
15 where we did all the work that was necessary to prepare it for launch. I don't really  
16 know that the days were especially long because we didn't have that much to do. It was  
17 so simplified that it was pretty easy, pretty simple.

18  
19 Walters: You had mentioned briefly earlier in the group interview about mosquitoes. I  
20 was wondering if you could elaborate on that just a little more.

21  
22 Droz: Oh really, they were terrible! That was really strange to have those fellows  
23 around with the flit guns because it was really necessary. A lot of snakes around there.  
24 I've seen snakes out there about that big. They were huge in those days. But the  
25 preparation that they used, that flit which is a mosquito repellent, worked pretty well, but

1 it wasn't sufficient to cover the area, of course. They just walked around and did the  
2 best they could.

3

4 Walters: I've heard some individuals referred to that there were a lot of African  
5 Americans that had been using the flit guns.

6

7 Droz: Yes, they were black.

8

9 Walters: And when you were here at Patrick Air Force Base and you wanted to go  
10 someplace to have a beer or have a good time, where did you go?

11

12 Droz: Well, there was a steak house that I can't remember, but the lady mentioned that  
13 there was one. I remember because Herman and I would go there.

14

15 Launius: Was there mention of a place called Fischers?

16

17 Walters: That was a fish and chips place; the forerunner of Bernard's Surf.

18

19 Droz: And then Bernard's had been established. I guess that's about it. Wasn't there a  
20 bar there? I think that's about it. Just normal in-the-field kind of living. I don't think we  
21 were so pressed for time. Our schedule was not that hard.

22

23 Walters: Did you have any type of activities at the Base to occupy your time, ball  
24 games, card games, anything of that nature?

25

1 Droz: Not that I remember. We occupied ourselves pretty well at work doing something  
2 that was necessary. Because of this heating thing, we developed a little insulation  
3 material that we put on at the lab. I won't tell you what the components were because  
4 that would give away the whole thing. But, anyway, it's very dry in Pasadena and so  
5 when we arrived here, it began to peel off. We had a really difficult time, so that took up  
6 some of our time. It was the insulation that we put on the outside of the WAC; fins,  
7 tanks, not the nosecone, but all the rest of it.

8

9 Starr: Was that to keep it from burning?

10

11 Droz: We thought it might help, we didn't know. But if you remember, the program was  
12 that the V2 would go horizontal at about 50 or 75,000 feet and we hadn't been in that  
13 area before. In particular, at the speeds that we expected, we didn't have any idea  
14 what would happen, and so we just took a chance. Even though we might not ever  
15 recover it, we thought still that we ought to do it, and we did.

16

17 Starr: How did you fix the problem of it peeling off?

18

19 Droz: We put it back on. It stuck the next time.

20

21 Starr: Was it material that you glued on?

22

23 Droz: No, it was just sprayed on.

24

25

1 Walters: I've got one question in regard to climate differences. When you come from  
2 White Sands in an area that's probably ideal for this type of work; where it's this nice dry  
3 non-humid heat and then you come here and you are in humidity and we have this salt-  
4 air corrosion, and they pick this site here. When you first came here did you say to  
5 yourself, why of all places here with all this salt air and potential corrosion?

6  
7 Droz: I certainly understood the reason for it. And so you don't question that. You just  
8 put up with it is. I'm not used to that kind of humidity. Well, White Sands, you know, is  
9 very, very, very warm. But, it's a dry heat. And even though it's 100 or 102 and you  
10 can't hardly touch the metal, still and all it's just not that uncomfortable. But when you  
11 get 90 degrees and 90 percent humidity, it's a whole different ballgame. But you just  
12 get used to it. I don't think that I was particularly disturbed by it, were you Herman?

13  
14 Bank: No, we just did our job and lived with it.

15  
16 Launius: Well, one last question, and we'll close this. What is your overall impression  
17 of the WAC Project, especially the Florida launch part of that? And, did you have a  
18 sense that you were making history? Because you were, indeed. Or were you just  
19 consumed with the job at the time?

20  
21 Bank: We were very ambitious at JPL, very goal oriented and we were consumed with  
22 the job. We had no idea of this event ever occurring. At least that's the way I saw it. It  
23 is a very lovely experience recognizing that we were fortunate enough to have worked  
24 on these things many years ago and it turned out this way.

25

1 Launius: Any thoughts?

2

3 Droz: At the time it was just a job. I was also involved with the Corporal at the same  
4 time that we were here and looking forward to that. It would become a missile now  
5 instead of a rocket, so I was involved in that, and so that's about as far as I was looking.  
6 I'm not a visionary, I don't dream of space and that sort of thing at all, but I guess I just  
7 roll with the punches. It's been a terrific experience for me. It's very meaningful. And  
8 now at the culmination of this whole thing here, well, it's very emotional. I can't tell you  
9 how much we appreciate what you people have done.

10

11 Bank: Thank you so much.

12

13 Launius: Are there any final thoughts or any impressions or comments you would like to  
14 make about the Bumper project?

15

16 Droz: I was glad to be involved in it, I really was.

17

18 Bank: Amen.

19

20 Launius: OK. With that, we will draw this to a close. Thank you, gentlemen so much  
21 for staying over and talking to us. Our plan at this point is to transcribe this oral history.  
22 We will send you each a copy of the transcript as well as the tape and ask you to take a  
23 look at it to be sure we've got it correct. There will probably be some questions that  
24 we'll want to fill in. For instance, you mentioned a fellow by the name of Anderson. I  
25 didn't ask you the question what his first name was.

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25

Droz: Phillip Anderson

Launius: Ok. We'll need to get that kind of information down for posterity. So, I guess with that, we will conclude. Thank you so much.

Droz: Thank you.

Bank: Our pleasure.